

Suitability modelling of banana production in Zimbabwe using Maxent

Kumbirai Beaton¹, Tatenda Manyuchi², Upenyu Mupfiga³, and Zedias Chikwambi²

¹Chinhoyi University of Technology School of Agricultural Science and Technology

²Chinhoyi University of Technology

³Midlands State University

September 4, 2023

Abstract

Aim Large-scale banana production in Zimbabwe is confined to agro-ecological zone 1, although other regions have managed to produce to a limited extent. This is mainly because of the favourable climatic conditions for banana growth found in this region. Across Zimbabwe, there are zones that can be modified to mimic climatic conditions in agro-ecological zone one. Therefore the aim of the research was to find suitable area that supports banana optimal growth. Location Zimbabwe Time period 36 months Major taxa studied Plantae, Magnoliophyta, Liliopsida, Zingiberales, Musaceae, Musa Methods In this study, new potential production areas were prospected using Maximum Entropy (MaxEnt). The data output was mapped in ArcGIS. An average of training and test Area Under Curve of 0.9380 and 0.976 respectively with a standard deviation of 0.03 was achieved after 10 replication trials. Results The Area Under Curve was represented by showing sensitivity on the y-axis and 1-specificity on the x-axis for all potential thresholds. Based on the bioclimatic data, the outputted model showed Area Under Curve values greater than 0.9 indicating a good prediction ability. Distinction of suitable areas from unsuitable areas was established using an automatic generated threshold. Low suitable areas ranged from 0-0.46, medium suitable areas ranged from 0.46-0.77 and high suitable areas ranged from 0.77-1. Potential production areas lied in the medium range due to a number of factors. An approximate total of 4757.112 km² was found to be suitable for banana expansion in Zimbabwe and this equates to over USD \$ 1,813,715.9844 billion dollars annually in net profit. Main conclusion The major environmental factors affecting banana distribution in Zimbabwe were found to be precipitation and temperature therefore irrigation schemes in suitable areas that has water bodies could be of great help towards banana production expansion. Keywords: banana production, Maxent, GIS, species distribution models

Hosted file

global ecology and biogeography main text.docx available at <https://authorea.com/users/473883/articles/663316-suitability-modelling-of-banana-production-in-zimbabwe-using-maxent>